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3 **PANORAMIC VIDEO SYSTEM WITH REAL-TIME**  
4 **DISTORTION-FREE IMAGING**

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6 **ABSTRACT OF THE DISCLOSURE**  
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8 A panoramic annular lens system (PAL), a unitary video camera and a  
9 PC-based software system that unwraps a 360° video image into a seamless,  
10 distortion free horizontal image image in real time. The PAL system of the  
11 preferred embodiment has a 360° horizontal field of view and a 90° vertical field  
12 of view in a 40mm diameter compact package. The invention is not limited to  
13 any particular type of lens system. In fact, there are numerous lens systems for  
14 providing a 360° panoramic view. The video camera may be a CCD or CMOS  
15 based device having a pixel resolution of either 1280 x 1024 (high resolution) or  
16 720 x 480 (NTSC). The unwrapping system is a radiometric ray tracing program  
17 carried out using a computer's graphics card capabilities to produce highly  
18 efficient regional transformation while minimizing software overhead. The result  
19 is real time, high resolution 30 fps conversion from a spherical distorted image to  
20 a flat panoramic image in Cartesian coordinates.  
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